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primitive seat of their forefathers was at Tullo (mount) Wolál, between Sayo and Afillo (the Christian country already mentioned), towards the river Baro. The tradition is universal among them as to their having first come from Bar-gáma, which is understood to mean "beyond the *bahr* or sea." But supposing the Gallas really to have come from the W., the expression Bar-gáma might mean "beyond the Baro."

V.—*A few Observations on the Ural Mountains, to accompany a New Map of a Southern Portion of that Chain.* By RODERICK IMPEY MURCHISON, Esq., President of the Royal Geographical Society, V.P.R.S., F.G.S., Corr. Mem. Inst. Fr., &c. &c.

THE Ural mountains being less known than other chains to which access is comparatively easy, I venture to call to them the attention of geographers, by briefly alluding to their physical features and mineral wealth, and by the publication of the accompanying map.

When viewed as a whole, the Ural constitutes a long and narrow ridge, which, extending from the Icy Sea on the N. to the parallel of Orenburg on the S., separates Europe from Asia throughout 18° of latitude. The southern half, reaching to 61° N. lat., is alone colonized, and forms the subject of this notice. The northern portion, covered with impenetrable forests and deep morasses, is still left to its wild inhabitants, whether Ostiaks, Voguls, or Samoyedes; its eastern flank having never been explored beyond 65° N. lat. (and that on one occasion only). To that north-eastern tract I will subsequently direct attention, when the labours of its chief explorer, Captain Strajefsky, will be co-ordinated with those undertaken during the last summer on the north-western flank of the chain by my friend and former companion Count Keyserling, who for the first time has truly developed the geography, geology, and natural history of the mouths of the great river Petchora, and has shown the real nature of the ground, including a ridge called the Timan, which trending, for about 500 miles, from the great headlands of the Icy Sea on the W.N.W. towards the Ural on the S.E., constitutes the north-eastern girdle of Europe. From these slightly-known Arctic regions, which will be geologically described in another work,* let us, in the mean time, turn to the portion of the Ural which is occupied by Russians.

Our illustrious foreign member, Von Humboldt, has taught us † that a considerable portion of the precious metals in use

* 'Russia in Europe, and the Ural Mountains' (in the press). By Roderick Impey Murchison, M. E. de Verneuil, and Count A. Von Keyserling.

† 'Fragmens Asiatiques' and 'Asie Centrale.'

among the Greeks and Romans was probably derived from this portion of the Scythian wilds; but modern Europe has been acquainted with them as sources of mineral wealth for a century and a half only. It was in the last year of the 17th century that Peter the Great formed the first mining establishments (Zavods) under the direction of his able envoy Demidoff, since which period a steady progress has been made in developing the resources of these mountains; and a large portion of the Siberian flank of the Ural may now be unhesitatingly considered one of the most civilized tracts of the empire, whether as regards the industry and intelligence of the natives or the state of arts and manufactures.

English readers may feel some interest in knowing to what extent this region and the mines of Siberia have proved productive. In the year 1837, the total gold produce of the Ural Mountains exceeded 304 poods, the larger half of which proceeded from private mines. At that period this chain was by far the richest seat of gold ore in the Russian empire; for all the other and more distant mines of Siberia, together, contributed but 130 poods; the total produce of the year 1837 being 444 poods. In 1838, the Ural mines yielding nearly the same as in the previous year, the eastern Siberian mines contributed 226 poods, making a total of 525. In subsequent years, however, the produce of the Ural slightly diminishing (the gold alluvia having been to some extent exhausted), the other auriferous tracts of Siberia, including the distant Altai Mountains and their dependencies, have prodigiously increased in value. In 1842, the total amount had already reached 1000 poods (nearly double that of 1838); and in the last year, 1843, it has swelled to the enormous quantity of 1342 poods!—the great increase having been chiefly derived from the governments of Tomsk and Yeniseik. Now, taking the pood at 43 lbs. 10 oz. 3 dwts. troy,* and estimating the ounce of gold at 3*l.* 17*s.* 10½*d.*, and the fineness of the gold at the British standard, the sterling value of the last year's produce of Russian gold amounts to 2,751,962*l.* Notwithstanding this vast increase, it is probable that, for many years, the produce may rather continue to augment than diminish; for the flanks of several distant chains in the boundless regions of Siberia, in which conditions favourable to the production of gold ore are known to exist, have as yet been very imperfectly explored.

Let us, however, now refer to the Ural chain alone. In 1837 it yielded, besides the gold, near 120 poods of platinum; and, though an equal or greater quantity might now be procured, the government has almost abandoned the extraction of this metal,

* The equivalent of the pood in English weight is taken from the last and best authority,—'Travaux de la Commission pour fixer les Mesures et les Poids de l'Empire de Russie:' rédigés par A. Ch. Kupffer. St. Petersbourg. 1841.

owing to the cost of reduction, and the repugnance of the people to receive it as a coin of high price. The platinum of the Ural is now chiefly worked by the Demidoff family. With small exceptions, near Ekaterinburg and Miask, where gold veins have been explored in the rock, the gold and platinum of the Ural are found in ancient alluvia, consisting of sand, gravel, and shingle. Enormous quantities of the purest magnetic iron ore are, however, extracted from the solid rock in open quarries; and in some districts, notably in that extending from Nijny Tagilsk to Bogoslofsk, copper veins abound. With one exception, all the gold mines are on the Asiatic or Siberian flank of the Ural, and on the same side are nearly all the rocks of eruptive or igneous origin, and all the great veins. The great mineral wealth of the chain occurs between 54° and 60° of N. lat.; the southern extremity, which is very picturesque, being comparatively poor, whilst the extreme north or Arctic region, containing few good ores, is yet unreclaimed, and is indeed unfitted for the existence of a civilized race.

Notwithstanding their great wealth and importance, no detailed Russian map of the inhabited parts of this region has yet been published; still less have these mountains been trigonometrically surveyed. A very useful general map has, however, been prepared in Prussia, through the labours of her enlightened geographers, led on by Baron Humboldt. It is appended to the work of his scientific colleague, M. Gustav Rose, who has so ably described the rocks and minerals of the chain. This map was the basis of the observations of myself and friends; and without the assistance we derived from it, we could not have attempted to unravel the true geological structure of these mountains.

Desiring to facilitate the inquiries of our expedition,* the Imperial Minister of Finance, Count Cancrine, had, through General Tcheffkine, directed the commanding officers at the different Zavods to prepare for my use, copies of such mineralogical and geographical maps as had already been executed. The most useful among these consist of mineral surveys of the mining country around Bogoslofsk, lat. 60°, by Captain Karpinsky; of the region near Ekaterinburg; and of the tracts near Zlatäùst and Miask, by Major Lissenko. These documents were of use to my friends and self in our attempt to construct a general geological map of the chain, and to bring the metamorphic masses, of which it is in great part composed, into accordance with the unaltered deposits of Russia in Europe. We also found, that since the preparation of Humboldt's map, new materials had accumulated, and that several detailed maps of districts had been

* Mr. Murchison was accompanied by M. E. de Verneuil, Count A. von Keyserling, and Lieut. Koksharoff.

published in the volumes of the School of Mines. In addition to these, Colonel Helmersen, one of the foremost in extending the geographical knowledge of the chain, has recently produced a small general map of the whole mountain range between the Northern Sea and the Sea of Aral.* The most important new feature of this map consists in the representation of a flanking eastern range, extending from N. to S., through the steppes of the Kirghiz, parallel to the Ural. Such, with a new MS. map of the South Ural, hereafter to be mentioned, are the materials which have been consulted.

Upon a general scale, the Ural Mountains, as before said, may be considered a narrow mural mass, trending from N. to S., and separating Europe from Asia. But this view calls for essential modifications. For example, though the northern portion is more or less constituted of a simple central ridge, it is fringed to some extent by low parallel embranchments, which, expanding in the South Ural, there constitute separate mountains to the W. of the chief crest; thus between Verch Uralsk and Sterlitamak the chain has a width of upwards of 100 miles. The true watershed of this chain, or the Ural-tau, has an average height of from 2000 to 2500 feet above the sea. It may be said to be continuous throughout nearly 18 degrees of latitude, being nowhere traversed by deep gorges or transverse streams worthy of the name of a river, though the affluents of the Tchussovaya, the Miass, and the Aï, present slight exceptions to this rule.

A central depression in the watershed, not 1400 feet in height, has been rendered available in constructing the great road from Russia to Siberia, by Ekaterinburg; and if the elevations of the Ural were to be judged of by the traveller who had seen them in no other latitude, he could scarcely apply to them the name of mountains. They are, however, rendered much more imposing, both to the N. and S. of Ekaterinburg, by rugged rocky summits, chiefly on the E. side of the crest, which, in N. lat. 60°, near Bogoslofsk, rise from 3000 feet into the Kondshakofskoï-Kamen 5720 feet above the sea; whilst in the Taganai (near Zlatäùst) and the Iremel or Eremel of the South Ural the altitudes are, respectively, 3600 and 5071 feet. These heights, and others marked upon the map, are chiefly derived from Colonel Helmersen and Baron Humboldt.

Unlike the Northern,† the Southern Ural is composed of many

* See Colonel Helmersen's Memoir, 'L'Oural et l'Altai,' Ann. des Mines de Russie, 1838. Since this and other communications were made, the author has published new barometrical and psychrometrical, as well as geological, observations on the chain. Reise nach dem Ural und der Kirgisen Steppe. Petersburg. 1843. The latter work contains a good account of the hilly tract, an eastern parallel of the Ural, called Djabyk Kurazai and Kara Edir-tau. (*See* Map.)

† The word northern is here used in reference to the accompanying map. In a general map of the whole meridian chain, this tract, extending from Bogoslofsk to the

separate longitudinal ridges, which, diverging from a common nucleus in a fan-shape, trend to the S. and by E. and S.S.W. With the exception of the plateau of the Sakmarka, nearly all this region is picturesque and highly diversified. It embraces the mountains Yurma or Jurma, Taganai, and Iremel; the latter, as already mentioned, attaining an altitude of near 5100 feet above the sea. The whole of the South Ural is included in the government of Orenburg, and is to a great extent a pastoral Baschkir country.

In addition to numerous detailed researches upon either flank of the chain, my own knowledge of its northern portion, laid down upon the map, was obtained by traverses in three parallels: 1st, by the depression, or high-road to Ekaterinburg; 2nd, by recrossing it from Blagodat, a celebrated mount of magnetic iron, and then descending the rivers Serebrianka and Tchussovaya; 3rd, by re-traversing from Ust Koiva by the mines of Chrestovosvidsgensk, near Bissersk, over the rugged mountain of magnetic iron called Katchkanar, to the imperial mines of Turinsk and the town of Verkhoturié in Siberia.

This last-mentioned route, known to few travellers, and undescribed by any man of science, may be taken as a type of the primæval lines of communication across the dense forests and deep morasses of this wild region when first colonized. Without the cordial assistance of my friend the late Prince of Butera (married to the proprietress of the gold-mines near Bissersk), no efforts of my companions or myself could have enabled us to force our way through the bogs and thickets which encumber the nearly obliterated path which was once a practicable roadway. To the N. of this track there exists no summer route whatever across the ridge; that which was used in the early periods of the colonization of Siberia, and even some time after the reign of Peter the Great, having nearly relapsed into its state of original wildness.* This circumstance is easily explained. The government has found it less costly and more convenient to centralize the products of the mines at Ekaterinburg (to which town the roads, proceeding from N. and S. in lateral depressions, are good and easily repaired), and thence to transport the materials by the great central route to the Tchussovaya river, by which, and its recipients the Kama and the Volga, they are conveyed to the heart of Russia, rather than to keep up a long line of land-carriage.

On the eastern flank of the Ural we examined all the mining

S. of Ekaterinburg, would necessarily be called the "Middle Ural," in contradistinction to the Arctic Ural and the Southern Ural—the former terminating in the glacial ocean, the latter along the line of the Sea of Aral, or in the high grounds between it and the Caspian. (*See* P.S.)

* M. de Verneuil and Count Keyserling went as far to the N. as Solikamsk, in the hope of reaching Bogoslofsk by that old road, but were compelled to return.

tracts between Bogoslofsk and Ekaterinburg, including the great establishments of the Demidoff family at Nijny Tagilsk, where 22,000 well-ordered and comfortably-housed inhabitants are gathered together under directors, whose skill and science have earned for them the eulogy of Humboldt.* From Ekaterinburg,† M. de Verneuil and myself descended the Issetz river in canoes (as we had done on the Serebrianka and Tchussovaya), to acquire a detailed acquaintance with the rocks on the Siberian flank of the chain; whilst Count Keyserling re-traversed it to follow, on its western side, the rivers Sylva, Ufa, and Ai. Regaining the ridge, and coasting it by the mines of Kyshtinsk and Soimanofski, I then passed over it obliquely to Zlatäùst, the great centre of the southern imperial mines. And here it was that we were witnesses to the very surprising progress in the manufacture of steel which the Russians have made in the last few years, under the direction of that skilful metallurgist and excellent administrator, General Anósoff,‡ whose damasked scimitars, as well as every description of ornamental steel, vie with, if they do not excel, any similar products of our own country.

From Zlatäùst, recrossing the Ural-tau to Miask (the centre of the gold-mines on this parallel), I then stretched eastward, accompanied by Lieut. Koksharof, into the low Siberian steppes, as far as the town of Troitsk, a mart of merchandize on the edge of the wilderness of the Khirghis, and at which the products of Bokhara are exchanged for Russian goods. Thence, regaining the eastern foot of the Ural, by crossing a low elevation of granite with metamorphic rocks (since marked upon the maps of Humboldt and Helmersen as a parallel ridge *Djabyk Karagai*), I travelled southwards, along the river Ural, to Orsk; from whence, passing

* In addition to hospitals and schools, in which even the sciences are taught, M. Anatole Demidoff has caused a trigonometrical survey of the extensive property of his family to be made by French engineers, who were surveying during the period of my visit.

† Besides its mining works, conducted by the imperial government and by the rich individual M. Jacoflef, Ekaterinburg is noted, in common with other places in Siberia —such as Kolyvan—for the polishing of precious stones by water-power, including the porphyries, agates, jaspers, and malachites, of the adjacent mountains.

‡ I would here refer the reader to a very elaborate criticism of Captain James Abbott (who travelled from India, by Khivah, to Russia) on the damasked swords of the East, and on those of Zlatäùst in particular, in which he uses expressions which I am delighted to repeat:—"The general fault of European blades is, that being forged of sheer-steel for the sake of elasticity, they are scarcely susceptible of the keen edge which cast-steel will assume. The genius of Anósoff has triumphed over this objection, not in hardening the soft steel, but in giving elasticity to the hard; and it may be doubted *whether any fabric in the world can compete with that of Zlatäùst in the production of weapons combining, in an equal degree, edge and elasticity.*"—Narrative of a Journey from Heraut to Khivah, Moscow, and Petersburg, vol. ii., Appendix, p. lxxxvii. An elaborately wrought and beautiful plateau, presented to me by the Imperial Administration of Mines, as well as a sword and dagger given to me by my kind friend General Anósoff, and all made under his direction at Zlatäùst, have excited the admiration of my scientific countrymen.

the southern end of the chain where it subsides into the lower Guberlinski hills, I reached Orenburg. I was there joined by my companions, who had traversed the tracts around Krasnoe-Ufinsk and Ufa.

Having made an excursion in the southern steppes to the famous mines of rock-salt at Illetzkaya Zastchita, we again re-entered the South Ural to visit General Perowski, then governor-general of Orenburg, at his *katchufka*, or summer retreat, situated amid groves of ilex. On that occasion he presented to me an original map, reduced from elaborate field-surveys executed under his orders by the Russian staff-officers. The sight of this beautiful map, which I have since given to the Geographical Society, made such an impression upon me, that I at once resolved, notwithstanding the short time at my disposal, to cross and recross the South Ural of the Russians by the only practicable routes. Whilst M. de Verneuil and myself, kindly protected by the distinguished general, and escorted by Baschkirs, were threading these picturesque mountains, our colleague, Count Keyserling, visiting Mount Bogdo, made himself acquainted with the steppe of the Kirghis, which lies between the Ural and the Volga. The route of myself and friend was by Preobrajensk, over the sharp ridge called the Irendyk (the southern prolongation of the Ural crest) to Verch Uralsk; from whence we finally turned W., and passed over the whole of the ridges and depressions of the chain, which are so expanded between that town and Sterlitamak on the Bielaya (see map).

In respect to this last-mentioned country, the map now published, which Mr. Arrowsmith has rendered a faithful reduction of that of General Perowski, and other Russian documents, will, I trust, be found a manifest improvement on the published documents which have preceded it.* The original can always be consulted in our library. The tracts which are laid down upon it (inhabited for the most part by Baschkirs, in their Asiatic costume) are more attractive than any part of the Russian empire which I have visited, and infinitely superior to the regions either around Ekaterinburg or to the north of that city. The forms of vegetation of the north and south are commingled, and the noble *Pinus cembra*—the type of the whole chain—which in the North Ural is accompanied by firs and birch only, is here surrounded by numerous forest-trees, and plants of warmer latitudes. The land, in many broad valleys or straths, is of the richest quality; and whether in the depressions of the Bialaya or its tributaries, or to the S. of Miask, near the sources of the Ural, I met with bands

* A Russian map of this territory and the adjacent lands, the country named by M. Khanikoff in his memoir 'the Western Advanced Range,' is in preparation by that author, to whose kindness I am much indebted for various corrections of the map now published, which is, perhaps, most defective in the S. Western part of the government of Orenburg.

of deep black mould (*tchornozem*), yielding the most splendid natural crops, and rank with various grasses.

A very brief outline of the geological observations made in these travels has been laid before the Geological Society, and more complete materials will be shortly presented to the public in a separate work upon the whole structure of Russia, in which an attempt will be made to explain the causes of the peculiar mineral condition of the Ural, accompanied by the first general geological map of the chain which has been prepared. As, therefore, geographical readers who seek for such information know where to find it, I dismiss this subject by simply saying, that in approaching the Ural from any point upon its western flank, the traveller proceeds from an undulating low region of red ground (included between the river Volga and edge of the mountains), which is entirely composed of the youngest rocks of the palæozoic æra—rocks feebly represented in England by the magnesian limestone and its associated red sandstone. Occupying a region more than twice as large as the kingdom of France, and extending from the Northern Sea to the Southern Steppes, over 18° of latitude, this red deposit of sand and marl, with limestone, gypsum, and sulphur, contains also, at intervals, a prodigious amount of copper, which does not occur in veins, as is usual, but is distributed in grains through the strata. It is to this vast cupriferous deposit I have applied the name of "Permian system;" seeing that in the ancient kingdom of Permia it exhibits a much finer development than the natural group of the same age in Western Europe, which has never yet had a collective name.

Rising from beneath this cover of Permian deposits, the European flanks of the Ural are composed, in descending order, of carboniferous, old red or Devonian, and Silurian rocks, all occasionally replete with fossils. Though many iron-mines (brown iron ore) exist, one gold-mine only is known on the western flank of the chain, and this, near Bissersk (where a few diamonds have also been found), is in the neighbourhood of an isolated mass of eruptive rocks. The crest of the chain, or watershed, is essentially composed of chloritic and quartzose rocks, altered palæozoic formations, which are immediately succeeded on the E. by numerous outbursts of rocks of igneous origin, amidst which, and in the metamorphic strata, which are in contact with them, occur all the most valuable mines of gold, platinum, copper, and magnetic iron, before alluded to. It is thus seen, that the productive mineral veins in these regions occur as constants, wherever the pre-existing strata have been much penetrated by igneous eruptions. On the Asiatic side of the chain there is no longer a trace of the horizontal red Permian deposits so rife on the western flank. Low hills of younger granite and other eruptive rocks, with palæozoic and metamorphic deposits, are there alone covered towards their

eastern edges, by tertiary accumulations and local detritus, in which the bones of extinct mammals (mammoth and rhinoceros) are mixed up with the gold sand and shingle of the mines.

But whatever success might attend the general geological survey, I felt convinced that little justice could be done by myself to the beautiful map of General Perowski. I therefore prevailed upon M. J. Khanikoff, a zealous geographer attached to the staff of the General, and who had studied the South Ural at his leisure, to furnish me with a description of it. His memoir would have been sooner communicated to the Society had it not been written in the Russian language. To render into English the precise meaning of many expressive Russian words has been no easy task for the accomplished translator* ; and even now it is doubtful to what extent he may have succeeded. The subjoined explanation of our editor will, however, develop the meaning of the author. In alluding to this memoir, I am, however, bound to state, that it not only specially illustrates the map of General Perowski and the South Ural of the Russians, but is an elaborate description of the physical features of a vast surrounding region, the improved Russian maps of which (extending even to the Aral and the Caspian) must be consulted, in order to make it fully intelligible.

In conclusion, I have only to express my hope that, however my own efforts may be received, geographers will look upon the accompanying map and the following memoir as evidences of the generous and noble conduct of his Imperial Majesty, who directed his representatives to furnish the English traveller with every document that could facilitate scientific research; thus proving that it is a principle of his government vigorously and munificently to encourage the advance of natural knowledge.

P.S.—In reference to some concluding observations in the memoir of M. J. Khanikoff, I would observe that his brother, M. N. Khanikoff, who has explored the regions between the Aral and Bokhara, recently communicated to me, at St. Petersburgh, some precise knowledge respecting the low mountains which, ranging from Mount Airuk towards the Aral, constitute one (perhaps the chief) of the southern prolongations of the Ural chain. From Captain Romanoff, who surveyed the northern edges of the Aral, I have also learnt that its shores there consist of marlstone cliffs, which subside eastwards into the low sandy deserts of the Sir, or Jaxartes. The same officer assured me that the large island in the northern part of the Aral Sea, which has so long found a place upon our maps, has no existence, its insertion having probably been caused by the figurative language of the Kirghis inhabitants, who speak of it as " an isle from whence

* Count Krasinski.

no traveller returns." I have further learned, from Colonel Helmersen, that M. Basiner discovered a mountainous ridge of greenstone, trending from N. to S., called Shik-Djeli, at the southern end of the Aral Sea, and on the right bank of the Oxus, N. of Khivah. These data, with a general correction of the outlines of the Caspian and Aral Seas, will shortly appear in the geological map of Russia.—(*October*, 1844.)

VI.—*Orographical Survey of the Country of Orenburg:* from the Russian MSS. of M. J. Khanikoff. (Communicated by the President.)

[Mr. Murchison has explained towards the close of the preceding paper what gave occasion to the composition of M. Khanikoff's memoir, and how it came to assume its present form. The disadvantages under which it will be seen from Mr. Murchison's statement, the memoir appears, will have prepared the reader to encounter a few passages in which the author's meaning may not appear so distinctly as could be wished. Some difficulties, which otherwise might arise from his peculiar technical phraseology, may be obviated by a few remarks upon that phraseology, and on his method of arrangement.

M. Khanikoff, like Mr. Murchison, applies the name Ural to the whole of the elevation, or bulging of the earth's surface, which extends in its longitudinal direction from the Icy Sea to Lake Aral. The portion of this mountain mass described in M. Khanikoff's Memoir, under the designation 'Country of Orenburg,' is that which extends from a line drawn E. and W. from the sources of the Miass southward to the Aral.

This portion M. Khanikoff views as composed of a central-mountain region and three advanced ranges; and upon this conception his first great division of the subject rests. He passes in review separately:—the central-mountain system; each of the three advanced ranges; and, in order to render his description more complete, the depressed plains or valleys which adjoin their bases.

The description of the central-mountain system is further subdivided. M. Khanikoff finding that the predominating form in the northern region is the Alpine, or combination of ridges; in the southern the plateau; describes each apart.

In his description of the Alpine or northern region he first follows the summit level or watershed of the region from its northern boundary to where it widens out into the plateau-formation; second, describes the western; and, third, the eastern declivity of the range. The method of description pursued under each of these three heads is nearly the same. M. Khanikoff designates the eminences which rise above the average level of the Ural mass "ridges," when their length is markedly greater than their breadth; "mountains" or "peaks" when these two dimensions are nearly equal. The higher elevations of each "ridge" he also calls "peaks." The "mountains" or "peaks" he distinguishes into five classes, according to their size and predominating forms. To these he adds a sixth, the syrt—a term used by M. Khanikoff in a

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VOLOGDA
VIATKA
PERM
R. Viatka
R. Kama
VIATKA
SLOBODSK
GLAZOV
OKANSK
SOLIKAMSK
TCHERDIN
KUNGUR
OSSA
OBVA
Otchersk
Nolinsk
Urjum
51
52
53
54
55
56
57
58
59
60

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R. Dioma
R. Bielaya
R. Ufa
R. Mias
Zlatoust
TCHELIABINSK
Miask
EKATERINBURG
Kamishlov
Dolmatov
L. Mayan
Sarapul
Krasnoufimsk
55
56
57


URAL MOUNTAINS
PERM
TOBOLSK
Northern limit of mines worked
TCHERDIN
SOLIKAMSK
PERM
VERKHOTURIE
KUNGUR
OKANSK
ALAPAIEVSK
IRBIT
Bogoslovsk
Petropavlovsk
Nij Tagilsk
Kushvinsk
R. Kama
R. Tura
R. Tagil
R. Sosva
R. Lozva
R. Kosva
R. Tchusova
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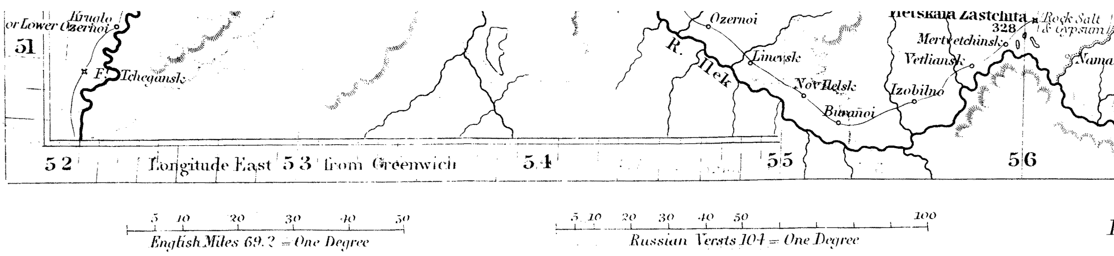
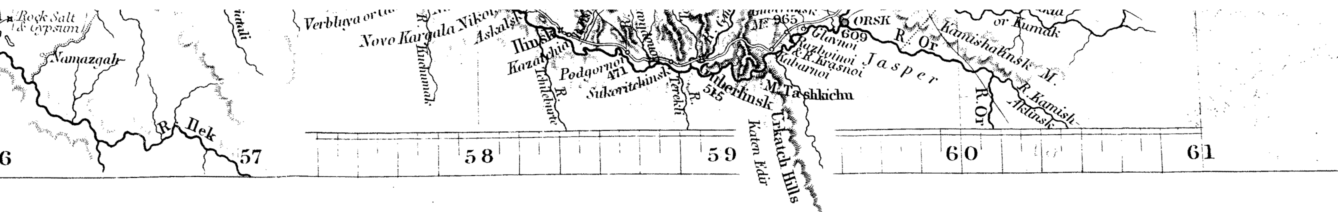


Kruglo or Lower Ozernoi
51
F. Tcheganskr
52
Longitude East 53 from Greenwich
54
55
56
R. Ilek
Ozernoi
Linevsk
Novi Ilelsk
Buranoi
Izobilno
Vetliansk
Mertvetchinsk
Zastchita
328
Rock Salt & Gypsum
5 10 20 30 40 50
English Miles 69.2 = One Degree
5 10 20 30 40 50 100
Russian Versts 104 = One Degree



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Pres. Roy.l Geog. Soc. _ Corr. Mem. Inst. Fr.

and

John Arrowsmith

F. R. G. S.